Rapid real-time surveillance and monitoring of pandemic influenza associated pneumonia & risk factors using primary care electronic medical records (EMR)

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Background: The arrival of the influenza pandemic (pH1N1) highlights gaps in surveillance. This pilot project leverages EMR to rapidly detect changes in the severity of influenza-like-illness (ILI) and associated risk factors to support public health actions.

Methods: The sentinel primary care clinics use their EMR with minimal operational disruption to transmit de-identified surveillance information daily to the secure Canadian Network for Public Health Intelligence (CNPHI) server at the Public Health Agency of Canada. The Canadian FluWatch ILI case definition is used:

- fever (T > 38 0C) and
- cough and
- myalgia or arthralgia or sore throat or fatigue.

Chi-Square, Fisher Exact and Mann-Whitney tests, with $p < 0.05$ (2-sided) denoting statistical significance are used.

Results: During the initial phase of the 12 month study (Oct 4-Nov 19, 2009), 237 medicallyattended ILI (MA-ILI) cases arising from 12,581 patient visits were reported from participating Canadian sentinel sites. Children under 10 years accounted for 33.8% of these cases. Pneumonia was reported in 8.4% of the MA-ILI cases, increasing from none in early October to 22.2% in the second week of November. Comparing ILI cases with pneumonia to those without, the median age was 30 years vs 21 years ($p = 0.5$); 50.0% vs 64.5% were females ($p = 0.2$); 0% vs 0.9% were health care workers ($p = 1.0$); median time from symptom onset to primary care visit was 5 days vs 2 days ($p = 0.02$); 0% vs 2.3% received the current season's influenza vaccine ($p = 1.0$), 5.0% vs 0.5% received the pH1N1 influenza vaccine ($p = 0.2$), 45.0% vs 39.4% received a pneumococcal vaccine ($p = 0.2$); 0% vs 3.3% had diabetes ($p = 1.0$) and 20.0% vs 23.4% had asthma ($p = 1.0$).

Conclusion: Children under 10 years were disproportionately affected but most cases were not life threatening. EMR was able to rapidly detect the shifts in the pandemic severity in real time. The proportion of ILI cases with pneumonia was escalating during the initial phase of this study. Pneumonia was associated with a longer time from symptom onset to primary care visit. With increasing sample size in this ongoing study, statistical power to assess vaccine effectiveness and severity risk factors is anticipated to increase greatly.

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Systemic MRSA infections

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Systemic Staphylococcal infections were always a dreaded complication of various injuries and for many centuries meant amputation or death for the unfortunate patient. MRSA has become since the 60's a major cause for systemic infections and in various settings are responsible to ~80% of all nosocomial bacteremias. In other settings, MRSA is responsible ~50% and in a recent survey of ICU infections among ~14.000 patients the infection rate had decreased to 47% (Vincent et al JAMA 302;2323:2009). MRSA infections are characterized by various clinical presentations from mild- to rapidly progressing and frequently with involvement of multiple organs includ. heart valvaes, bones, joints and implanted foreign bodies. Those locations, with the particular resistance pattern of MRSA, and only a few effective antibiotics to choose from, make MRSA infections particularly difficult to treat with a frequent need for surgery. The frequent use of foreign bodies in therapy (IV catheters, implants,dialysis catheters, CNS shunts etc') and the biological avidity of this organism to these foreign materials add to the complexity of the infection. Quorum sensing and the ability of the organism to create a biofilm and to detach from the adherent colony add also to the complexity of these infections. Understanding of these biological mechanisms and being able to interfere should allow for some future therapeutic measures. Evidently, meanwhile, hospital infection control and a possible future staphylococcal vaccine are solutions to peruse. CA MRSA can be controlled by hyginic measures as well as vaccine as this organism despite its low potential to cause systemic infections is likely to stay for many years.

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Treatment of severe MRSA infections: Beyond Vancomycin

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Vancomycin, as the gold standard for therapy of severe MRSA infections, particularly pneumonia, bacteremia, and endocarditis, has been questioned. In recent years reduced vancomycin susceptibility of MRSA has been noted: minimum inhibitory concentrations (MIC) have increased, isolates with intermediate susceptibility (MIC 4 to 16 $g/ml) [VISA] and overtly resistant (MIC ''32 $g/ml) [VRSA] have been noted, and importantly isolates of apparently vancomycin susceptible MRSA with subpopulations exhibiting intermediate susceptibility to vancomycin (survival at vancomycin concentrations'' 4 $g/ml) so called heteroVISA [hVISA] have been encountered. VISA and hVISA isolates may emerge when vancomycin therapy is suboptimal. Severe MRSA infections caused by isolates with vancomycin MIC'' 1.5-2.0 $g/ml and hVISA have been associated with poor clinical outcome